BASIC CONCEPT OF BOAT & STREAM

B   =   Speed of Boat in still water

S   =   Speed of Stream

with flow of water

against the flow

Downstream $= (B + S)$

Upstream $= (B - S)$

E.g. 1:

If B = 20 km/ hr ; S = 8 km/ hr

Find D and U.

$$D = B+S = 28 \text{ km/h}$$

$$U = B-S = 12 \text{ km/h}$$

$$D = B + S \qquad - \text{(1)}$$

$$U = B - S \qquad - \text{(2)}$$

Add (1) & (2)

$$\frac{D + U}{2} = B$$

(1) − (2)

$$\frac{D - U}{2} = S$$

E.g. 2:

If D = 20 km/ hr ; U = 8 km/ hr

Find B and S.

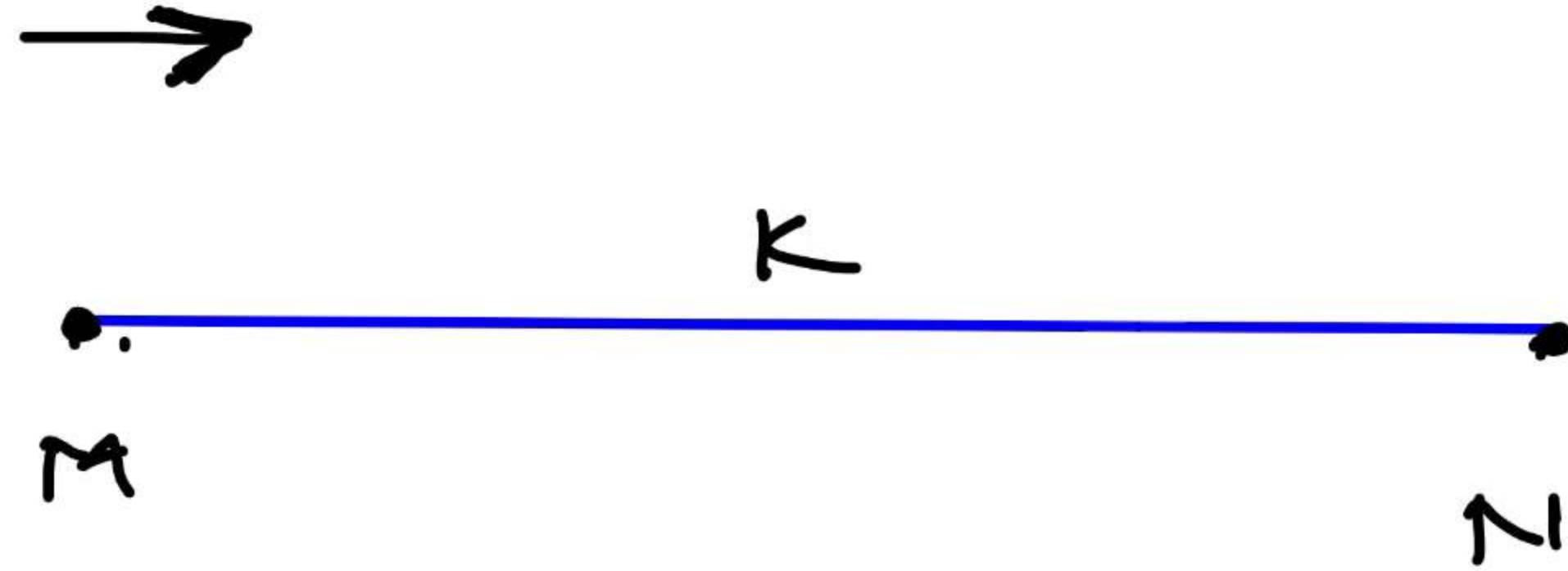$$B = \frac{D+U}{2} = 14 \text{ km/h}$$

$$S = \frac{D-U}{2} = 6 \text{ km}$$

Q1. A boat moves downstream at the rate of 1 km in 7½ minutes and upstream at the rate of 5 km an hour. What is the speed of the boat in the still water?

(a) 2 km/hour
(b) 6½ km/hour
(c) 4 km/hour
(d) 3½ km/hour

$$D = \frac{1}{\frac{7\frac{1}{2}}{60}} \Rightarrow 8 \text{ Km/h}$$

$$U \Rightarrow 5 \text{ Km/h}$$

$$B = \frac{8+5}{2} = \frac{13}{2} \text{ Km/h}$$

→

K

M ———————————————————— N

$$\frac{K}{B+S} + \frac{K}{B-S} = \text{Total Time}$$

$B = 10 \, Km/h \qquad S = 4 \, Km/h$

Q2. A man goes downstream with a boat to some destination and returns upstream to his original place in 5 hours. If the speed of the boat in still water and the stream are 10 km/hr and 4 km/hr respectively, the distance of the destination from the starting place is

Let Distance $= x$

$$\frac{x}{14} + \frac{x}{6} = 5$$

$$\frac{3x + 7x}{42} = 5$$

$$\boxed{x = 21}$$

(a) 16 km (b) 18 km

(c) 21 km (d) 25 km

Eg(i). $\dfrac{36}{B+2} + \dfrac{40}{B-2} = 12$

5   7   8

4   8

$B - 2 = 5$

$B = 7,$

$$\text{Eg(ii).} \quad \frac{50}{B-5} + \frac{40}{B+5} = 7$$

$$\uparrow \frac{50}{B-5} \downarrow \quad + \quad \frac{40}{B+5}$$

$$\frac{4}{5} \qquad \frac{3}{2}$$

$$B - 5 = 10$$

$$B = 15$$

Eg(iii). $\dfrac{24}{B+2} + \dfrac{32}{B-2} = 11$

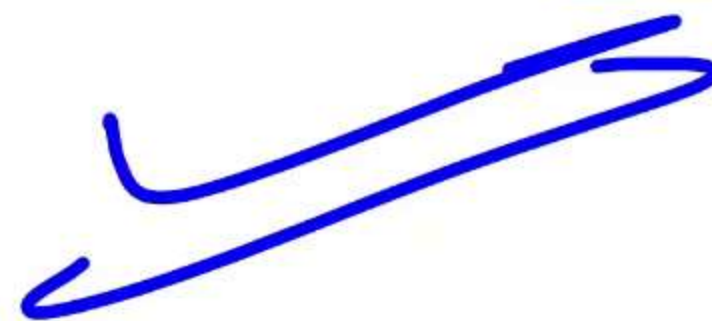4   7 $\nearrow$

3        $\boxed{8}$

$B - 2 = 4$

$B = 6$

Eg(iv). $\dfrac{120}{B+2} + \dfrac{120}{B-2} = 11$

5   6

$B - 2 = 20$

$B = 22$

Eg(vi). $\dfrac{25}{B+3} + \dfrac{36}{B-3} = 11.5$

$$\frac{50}{B+3} + \frac{72}{B-3} = 23$$

11   12

5   18

$B - 3 = 4$

$B = 7$

$S = 5 \text{ km/hr}$

$$\frac{10}{B-S} + \frac{10}{B+S} = \frac{5}{6}$$

$$\frac{60}{B-S} + \frac{60}{B+S} = 5$$

$$3 \qquad 2$$

$$B - S = 20 \qquad B = 25$$

Q4. The speed of the current is 5 km/hr. A motorboat goes 10 km upstream and back again to starting point in 50 minutes. The speed (in km/hr) of the motorboat in still water is

(a) 20

(b) 26

(c) 25

(d) 28

A boat covers a certain distance downstream in T_1 hours and the same distance, when covered upstream it takes T_2 hours. Then find the ratio of (Speed of boat in still water): (Speed of stream).

Downstream   Upstream

$$T_1 \qquad : \qquad T_2$$

Time

Speed

$$T_2 \qquad : \qquad T_1$$

$$\frac{B+S}{B-S} = \frac{T_2}{T_1}$$

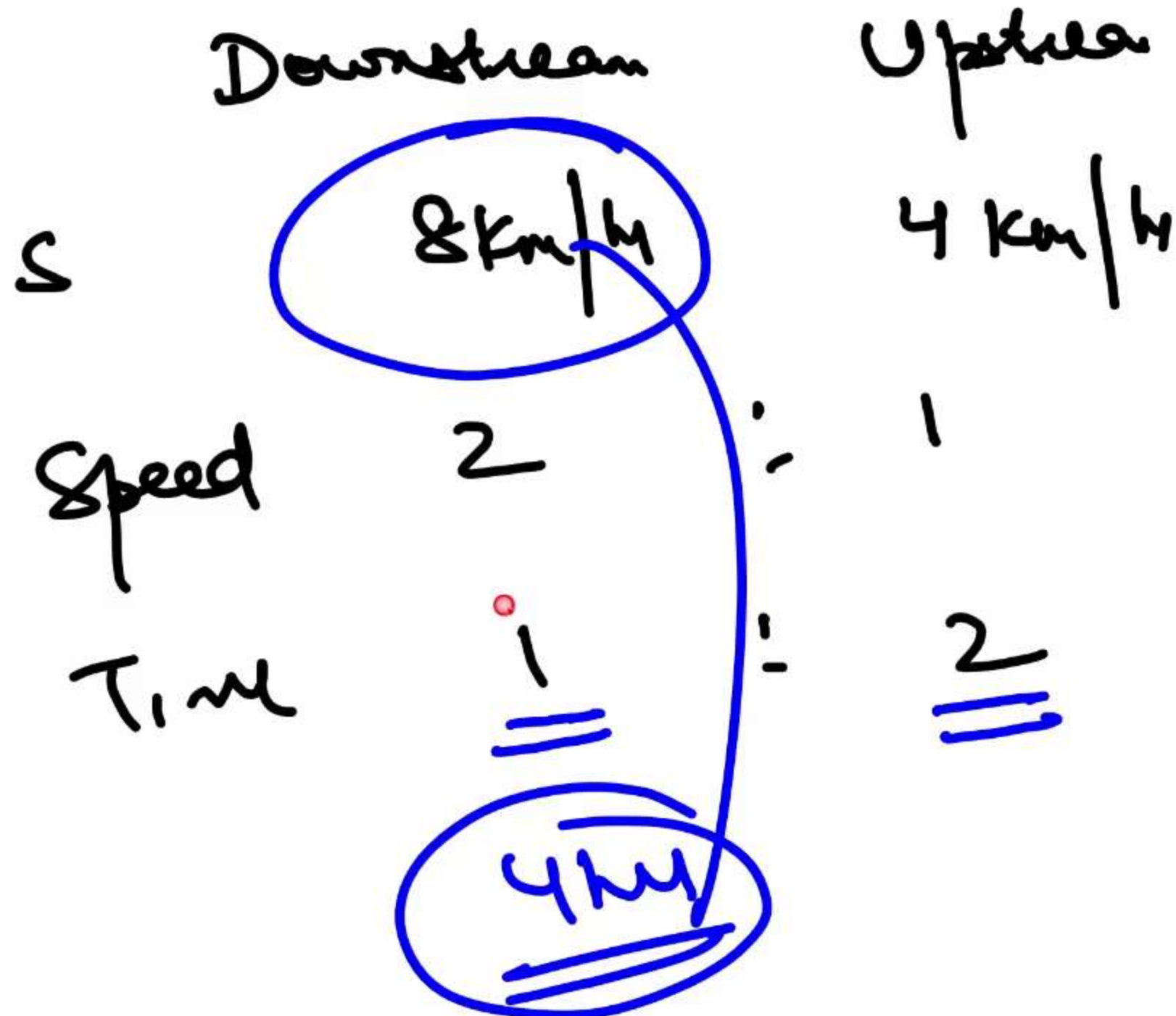$$\boxed{\dfrac{B}{S} = \dfrac{T_2 + T_1}{T_2 - T_1}}$$

$B = 6 \text{ km/h}$

$S = 2 \text{ km/h}$

Q6. A man can row 6 km/hr in still water. If the speed of the current is 2 km/hr, it takes 4 hours more upstream than in the downstream for the same distance. The distance is:

(a) 30 km

(b) 24 km

(c) 20 km

(d) 32 km

Downstream   Upstream

	Downstream	Upstream
Speed	8 km/h	4 km/h
	2	1
Time	1	2
	4 km	

$1 \rightarrow 4 \text{ hours}$

$D = 32 \text{ km}$

Q7. A boatman goes 44 km downstream and 30 km upstream and takes 10 hrs. While it takes 13 hrs. to go 55 km downstream and 40 km upstream. Find the speed of boat and stream.

D | U | Time
44 Km | 30 Km | 10 hr ×4
55 Km | 40 Km | 13 hr ×3

11 Km ⟶ 1 hr

$B + S = 11 \text{ km/hr}$

$B - S = 5 \text{ km/hr}$

$B = 8 \text{ Km/hr} \quad S = 3 \text{ Km/hr}$

	U	D	Time

$$\boxed{12\,Km} \quad \boxed{18\,Km} \quad \underline{3\,hr} \times 3$$

$$36\,Km \qquad 24\,Km \qquad 6\tfrac{1}{2}\,hr \times 1$$

$$30\,Km \qquad\qquad 2\tfrac{1}{2}\,hr$$

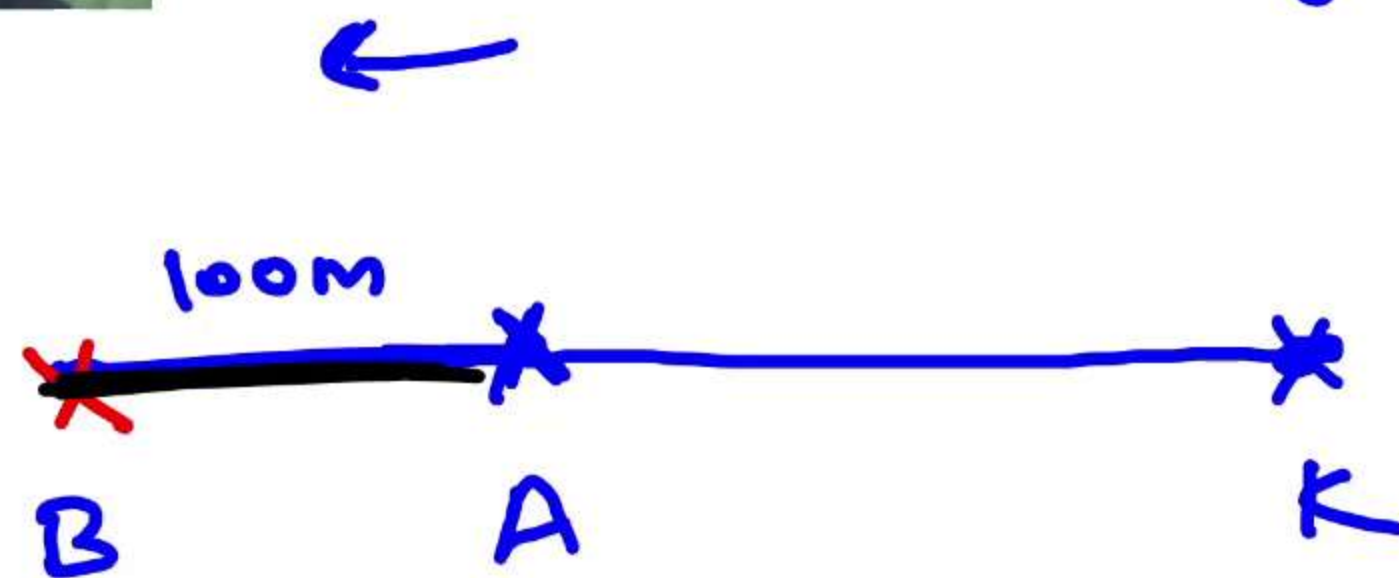$$D = 12\,Km/hr$$
$$U = 8\,Km/hr$$

Q8. A boat covers 12 km upstream and 18 km downstream in 3 hours, while it covers 36 km upstream and 24 km downstream in 6½ hours. What is the speed of the current?

(a) 1.5 km/hour

(b) 1 km/hour

(c) 2 km/hour

(d) 2.5 km/hour

2 min

$$S = \frac{D - U}{2} = 2\,Km/hr$$

V. Imp

←

100M
×————×————————————×
B   A   K

Q9. A swimmer swims from a point A against a current for 5 minutes and then swims backwards in favour of the current for next 5 minutes and comes to the point B. If AB is 100 metres, the speed of the current (in km/hr) is:

(a) 0.4   (b) 0.2
(c) 1   (d) 0.6

$A K \longrightarrow (B - S)$

$K B \longrightarrow (B + S)$

Diff in speed $= 2S$

$0.1 = 2S \times \dfrac{8}{60 \, \cancel{\times} 6}$

$S = 0.6 \ km/h$